What's at the end of the line for Akaroa wastewater – infertile fish?

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The small township of Akaroa on the eastern tip of Banks Peninsula is in a quandary over the future of its wastewater system. The factors that make this difficult community issue unique to such a quaint, adorable Canterbury backwater resort are its large transient population of bach-owners from Christchurch City, its remoteness from provincial governance, and the steep-sided topography of the terrain that limits the amount of available space to deploy an adequate land application system as an alternative to the current discharge of treated waste to harbour.

In the absence of constraints as powerful as the Resource Management Act (1991), in the 1960's there were few controls over the design of the original wastewater treatment system at Akaroa with respect to its environmental impacts and long-term sustainability, leading one to ask how a new system can be adequately designed to replace the ageing infrastructure and meet the growing needs of this popular summer haven. Now that administration of the Banks Peninsula district has been taken over by a council geographically distant and relatively isolated from the community, the provision of a solution that the township can live with is challenging.

In order to understand the dynamics at work here it is important to have some knowledge of the history behind the location of the existing treatment plant and the transition of political power away from the locality, and to listen intently to the diverse voices of the local community.

Some History

The southern corner of Takapuneke (Red House Bay) was bought by the (then) Akaroa County Council and in 1960 a wastewater treatment plant was constructed at Green Point on top of a sacred Maori site, where there was a massacre in the 1830s. In 1979 a county rubbish tip was opened uphill from the bay, just above the kainga, but was subsequently closed in 1998, with the council apologising to the Onuku runanga for placing the wastewater works and dump in such a culturally significant place. However, the council maintained that the treatment plant could not be removed, due to its size and vitality for the Akaroa township. In 2002 the area was registered as wahi tapu by the Historic Places Trust (Darling, 2005b; Keene, 1998).

Historically, the limited capital expenditure budget available to the old Banks Peninsula District Council (BPDC) has been insufficient to provide adequate wastewater infrastructure to cope with the demand of peak summer tourism, when the town population swells from a few hundred to several thousand; and sewage spills have occurred due to the age and condition of the piping infrastructure in significant wet weather events. In 2001 a Ngai Tahu Fisheries application for resource consent for the development of nine coastal marine mussel farms in the harbour was declined on the basis that such sewage releases could contaminate the product (Hutching, 2001), although ironically there is already extensive marine farming across the harbour from Akaroa.

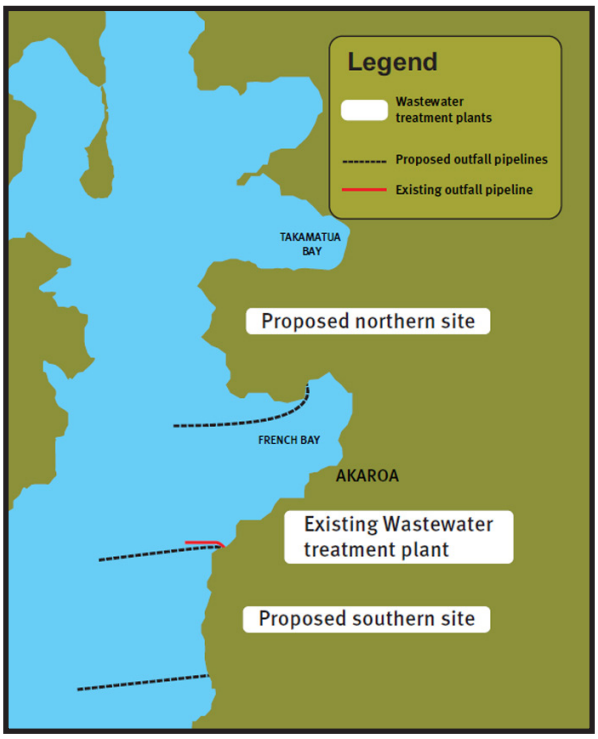
In 2005 the BPDC advised that they would ask the regional council, Environment Canterbury (ECan) to conduct tests south of the wastewater treatment plant after locals raised concerns about water quality in that area. The BPDC reported that the high ammonia nitrate levels in the early months of 2005 could trigger algal blooms. ECan advised that the capacity of the treatment plant had been reached during that period, and that extra storage may be required prior to release into the harbour. Although the BPDC had advised in 1996 that the plant could contribute up to 4% of the total nitrogen and phosphorous entering the harbour, the plant's 10-year resource consent that was due for renewal in 2007 did not specify a requirement to monitor water quality around the outfall. ECan pointed out that there was no correlation between the concentrations of nutrients in the sewage discharge and the actual volume of sewage discharged (Darling, 2005a).

The wastewater treatment primary stage comprises two sedimentation tanks, after which there is biological treatment in a trickling filter and secondary sedimentation subsequently disinfected by ultraviolet light. The treated wastewater is discharged into the harbour via a 100m long outfall pipe. Upgrades to the treatment plant have been carried out in 1984, 1998 and in 2009. The BPDC was disestablished in March 2006, and the region is now administered by the Christchurch City Council (CCC). According to the CCC website the current resource consent for discharge to the harbour (CRC 071865) was approved in 2008, and expires in 2013. The consent is conditional on CCC establishing a community working party to investigate alternative long-term wastewater treatment options, and on meeting a series of milestones and objectives, to demonstrate progress towards a management solution. A working party was indeed established in 2008, and public submissions on a range of options were received by CCC in mid-2010. According to CCC City Environment Group's Zefanja Potgieter, the amended date for the Council to select a long-term wastewater option is December 2011; therefore the working party's preference will be determined in the second part of 2011.

Current Options

The options currently on the table, according to the CCC website, are to improve the quality of the wastewater, discharge further out into the harbour (either at the current site or at a new location to the north or the south of the present site), or to discharge an improved standard of waste to land. A combination of these options might be considered, whereby waste is discharged to land only during dry weather conditions. An option to pipe the waste to sea beyond the mouth of the harbour may be considered, but is a high cost alternative.

[Please look at the following page for graphic]



Source: Christchurch City Council web pages, retrieved September 6, 2010, from http://resources.ccc.govt.nz/files/AkaroaWastewaterinfo27-04.pdf

Statistics

According to the Statistics New Zealand 2006 census, Akaroa's population of permanent residents was 570 (declining since the 2001 census), and Akaroa Harbour was home to 735 people (increasing since the 2001 census). However, according to the CCC web pages, "the treatment plant services the whole of the Akaroa community of around 650 permanent residents, but does not extend over the hill to Takamatua, and ironically neither does it service the Onuku Marae community." CCC advised that they received 22 submissions which, based on Statistics New Zealand data of an average of 2 people per household in Akaroa Harbour, equates to a response rate of between 3-7%. One might speculate that this apparently low community participation may be due to their unfailing confidence in their representation through the working party (which comprises a cross-section of the community), or that it is a complex technical issue about which they do not feel confident expressing an opinion, or it could simply be due to apathy, or a combination of the above. However, it must be noted that a CCC representative regularly attends local public meetings, so the community can have their say here too, albeit to a lesser extent.

Of the submissions[1], 52% prefer the status quo (an upgraded plant in the same location, discharging further out into the harbour), 24% prefer discharge of higher quality wastewater onto land, 14% have no preference, and 10% would like an upgraded plant in a new location, discharging further out into the harbour. 19% oppose the status quo (particularly those who value the cultural and spiritual significance of the site), 19% oppose relocation to the north, 19% oppose discharge to land, 10% oppose relocation to the south, and 10% oppose discharge into the harbour of any description.

Community-offered Solutions

Some submitters offered imaginative alternative solutions, such as the recycling of grey water for non-potable use, installing septic tanks, low-flush toilets, and primary treatment systems in holiday parks. CCC were advised to choose their discharge outlet points carefully with respect to best dispersion, to take advantage of stronger outgoing tides, and to be located away from marine reserves. Some preferred to keep the cost to the ratepayer low by re-utilising existing infrastructure, while others would rather have a high-quality solution regardless of the expense, including piping out to sea beyond the heads.

Of interest, but not necessarily of any great significance, was that a few submitters were concerned about the release of oestrogens into the harbour. Sewage discharge is a major source of human oestrogens in marine ecosystems, and there has been growing concern over their effects on marine organisms (Saravanabhavan et al., 2009). Women excrete natural oestrogens, the primary female sex hormones secreted by all vertebrates, and also synthetic oestrogen used in the birth control pill; and neither source is completely broken down in the wastewater treatment process. When the process involves pumping treated sewage out to sea these oestrogen compounds have been found to 'feminise' marine organisms and disrupt their reproductive processes. In their research Jobling et al. (1998) recorded a high incidence of intersexuality in fish, whereby males were producing early stage eggs or egg proteins, or developing smaller gonads; thus impairing their ability to produce sperm and fertilise eggs, leading to a decline in population. This, in turn, can have a snow-balling impact on the entire predatory ecosystem.

Similarly, research on male birds that eat earthworms at sewage treatment plants has determined that although the oestrogen found in the human waste is causing the birds to be more virile and more attractive to female birds, the researchers are worried that the greater mating success by these birds will lead to weaker, less potent offspring (Schardt, 2008). So release of oestrogens on to land may also be an issue.

However, using inexpensive materials, abiotic transformation methods in wastewater systems have been developed for improving the removal of oestrogens from the environment (Marfil-Vega et al., 2010), and 80-90% of the oestrogens can be taken out when the waste is treated with at least secondary treatment. These methods could be considered in the design of the Akaroa treatment plant.

1 Andrews, V; Andrews, V & Davis, A; Arnold, P & Marshall, P; Beattie, R; Brocherie, T; Carter, L; De Hamal, M; Disse, W & M; Julian, A; McIvor, B; McIvor, J; Molloy, K; Moore, I & S; Naish, R & S; Parkes, V; Reid, B; Reid, K; Rolleston, H; Sheridan, G; Shirley, J; Slooten, L; Weir, C

Conclusion

According to Mr Potgieter, capacity can easily be built into the system to cope with future demand, the quality of the discharge can be improved to such an extent that it has a negligible affect on the environment, and the effluent plume can be safely dispersed outside the harbour if funds are available to risk building a 12 km long outfall in very active seabed conditions at the harbour mouth and beyond. Mr Potgieter confirms that there should be enough land available to cope with the soil hydraulic loading should a land-based option be wholly or partially adopted. It remains to be seen whether CCC can provide an imaginative long-term solution that the community can be proud of, against the current backdrop of competing priorities for Christchurch capital projects through the Long Term Council Community Plan.

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